

R E M A R K S

Reconsideration of this application, as amended, is respectfully requested.

THE SPECIFICATION

The Examiner's indication of the non-compliance of the amendments to the specification at the paragraph on page 53, lines 5-18 in the Amendment filed on August 30, 2007 is acknowledged. The paragraph at page 53, lines 5-18 has now been correctly amended to indicate all changes made with proper underlining and bracketing. The amended paragraph at page 53, lines 5-18 set forth above replaces the same amended paragraph as set forth in the Amendment filed on August 30, 2007. No new matter has been added, and it is respectfully requested that the amendments to the specification be approved and entered.

THE CLAIMS

Independent claim 1 has been amended to recite the feature of the present invention whereby the optical DNA sensor includes an exciting light absorbing layer between the DNA probes and the photoelectric elements to absorb exciting light. In addition, independent claims 1 and 5 have been amended to recite a conductive layer which discharges charges caused by electron-hole pairs generated by the absorbed exciting light in the exciting

light absorbing layer. See the disclosure in the specification at, for example, page 48, lines 1-7 and page 53, line 19 to page 54, line 10.

Still further, independent claims 8 and 10 have been amended to recite means for applying negative voltage to the light-transmissive top gate electrode in a charge storage period, and means for applying one of a positive voltage and a ground potential to the transparent conductive layer. See Fig. 8 and the disclosure in the specification at, for example, page 80, line 18 to page 81, line 6.

Yet still further, new claims 18-21 have been added to recite additional features of the present invention shown in Figs. 4A, 4B and 8, and described in the specification at, for example, page 80, line 18 to page 81, line 6.

Claims 6, 7 and 9, moreover, have been canceled without prejudice, thereby obviating the rejection of claim 6 under 35 USC 112.

No new matter has been added, and it is respectfully requested that the amendments to the claims be approved and entered and that the 35 USC 112 rejection be withdrawn.

THE PRIOR ART REJECTION

Claims 1, 5-6 and 9 were rejected under 35 USC 103 as being obvious in view of the combination of USP 5,846,708 ("Hollis et

al") and USP 6,300,160 ("America et al"), and claims 4, 7, 8, 10-13 and 17 were all rejected under 35 USC 103 as being obvious over in view of various combinations of Hollis et al, America et al, USP 5,381,028 ("Iwasa"), USP 5,468,606 ("Bogart et al") and USP 5,843,655 ("McGall et al"). These rejections, however, are respectfully traversed with respect to the claims as amended hereinabove.

Re: Independent claims 1 and 5

According to the present invention as recited in each of amended independent claims 1 and 5, an exciting light absorbing layer is provided between the DNA probes and the photoelectric elements to absorb exciting light, and a conductive layer is provided which discharges charges caused by electron-hole pairs generated by the absorbed exciting light in the exciting light absorbing layer.

That is, according to the present invention as recited in amended independent claims 1 and 5, the exciting light absorbing layer absorbs phosphor exciting light, and the absorbed exciting light produces electron-hole pairs which cause generation of a charge in the exciting light absorbing layer. In order to remove this charge, according to the claimed present invention as recited in claims 1 and 5, the conductive layer is provided which discharges the electric charges generated in the exciting light

absorbing layer. See the disclosure in the specification at page 51, lines 12-20 and page 53, line 19 to page 54, line 10.

Therefore, with the structure of the claimed present invention, an advantageous effect is achieved because the noise caused by the exciting light is removed and sensitivity and accuracy of light detection by the photoelectric elements is improved.

It is respectfully submitted that the combination of Hollis et al and America et al does not at all disclose, teach or suggest the above described structural features and advantageous effects of the present invention as recited in each of amended independent claims 1 and 5.

With respect to exciting light absorbing layer of the claimed present invention, on page 6 of the Final Office Action, the Examiner appears to suggest that the exciting light absorbing layer is obvious over the material of Hollis et al to which the DNA probes are fixed and which may not be light-transmissive (i.e., absorbs exciting light). However, it is respectfully pointed out that the filter 250 of Hollis et al may be considered to better correspond to the exciting light absorbing layer of the claimed present invention (see Fig. 15 and col. 9, lines 45-51 of Hollis et al).

With respect to the filter 250, Hollis et al teaches that the filter 250 is of aluminum or tungsten metal grating or

dielectric multilayer interference filter which blocks radiation of excitation light. However, contrary to the claimed present invention, Hollis et al does not at all disclose, teach or suggest that a voltage is applied to the filter 250. As shown in Fig. 15 of Hollis et al, since the filter 250 is structurally floating between the dielectric or polymer layers 216, the filter 250 cannot release an accumulated charge even if the filter 250 were made of metal.

Therefore, since the filter 250 of Hollis et al better corresponds to the exciting light absorbing layer of the claimed present invention and since the filter 250 of Hollis et al would also generate electric charges by energy of absorbed light as generated by the exciting light absorbing layer of the claimed present invention, the apparatus of Hollis et al would have the problem of noise in which the generated electric charges in the filter 250 exert a negative effect to the light detection by the CCD 220 underneath. Clearly, this problem is not solved in Hollis et al because the gate electrode 220 of Hollis et al does not correspond to the conductive layer which discharges the electric charges generated in the exciting light absorbing layer as according to claims 1 and 5 of the present invention.

In addition, it is also noted that in order to teach the missing feature of transparent gate electrodes, the Examiner has cited America et al. It is respectfully submitted, however, that

even if America et al were combinable with Hollis et al in the manner suggested by the Examiner, such combination would still not disclose, teach or suggest the structure of the claimed present invention which achieves the function of discharging charges caused by electron-hole pairs generated by the absorbed exciting light in the exciting light absorbing layer and the advantageous effects of noise removal and sensitivity improvement.

In particular, it is respectfully submitted that the cited portion of America et al merely teaches that ITO (Indium Tin Oxide) is used for a transparent gate electrode material 32 and that a polish buffer layer 34 is placed over the gate electrode material 32 (see Fig. 2d). Subsequently, according to America et al, etching processing is performed, so that finally U-shaped gates 61 and 62 are formed around the deposited Si layer 16 (see Figs. 2e-2i).

However, it is respectfully submitted that the U-shaped gates 61 and 62 of America et al are merely gate electrodes of a CCD and do not correspond the conductive layer of the claimed present invention which discharges electric charges generated in the exciting light absorbing layer. In this connection, it is noted that even if the U-shaped gates 61 and 62 of America et al were considered to discharge electric charges as according to the conductive layer of the claimed present invention, the discharge

would become noise so that the CCD of America et al would not function properly.

By contrast, according to the claimed present invention, the exciting light absorbing layer absorbs exciting light to prevent it from entering into the photoelectric elements and the conductive layer discharges the electric charges in the exciting light absorbing layer, which are generated by absorbing the exciting light, so that the generated electric charges do not effect the photoelectric elements. And with this structure, the advantageous effects of noise removal and sensitivity improvement are achieved. Clearly, America et al is silent about these features and advantages.

Iwasa et al, moreover, has been merely cited to teach features of dependent claim 4.

Re: independent claims 8 and 10

According to the present invention as recited in each of amended independent claims 8 and 10, means for applying negative voltage to the light-transmissive top gate electrode in a charge storage period is provided, and a transparent conductive layer is provided in the solid imaging device between the DNA probes and the plurality of photoelectric elements. In addition, means for applying one of a positive voltage and a ground potential to the transparent conductive layer is also provided.

As recited in independent claims 8 and 10, the light-transmissive protective layer is configured to have a plurality of types of DNA probes aligned and fixed thereon. When performing DNA identification, in order to hybridize nucleotide strands of a sample to the DNA probes, the nucleotide strands should be able to easily access the DNA probes. And as disclosed in the specification at page 30, line 17 to page 31, line 16, the bases of the nucleotide strands are negatively charged. However, since negative voltage is applied by the means for applying the negative voltage to the light-transmissive top gate electrode of each photoelectric element positioned at the side of the DNA probe in an operating step of the charge storage period, the electric field of this negative voltage causes electrostatic repulsion of the nucleotide strands, resulting in a poor accessibility to the DNA probes.

With the structure of the claimed present invention as recited in independent claims 8 and 10, however, since the means for applying one of a positive voltage and a ground potential applies the one of the positive voltage and the ground potential to the transparent conductive layer, an advantageous effect is achieved whereby the DNA probes are attracted and easily bonded to an outer surface of the solid imaging device (e.g., the light-transmissive protective layer).

It is respectfully submitted that even if all of Hollis et al, Hawkins et al, Bogart et al, and McGall et al were combinable in the manner suggested by the Examiner, these references still do not disclose, teach or suggest the above described structural features and advantageous effects achieved by the means for applying the negative voltage, the means for applying the one of the positive voltage and the ground potential, and the transparent conductive layer of the present invention as recited in amended independent claims 8 and 10.

It is respectfully pointed out, moreover, that the means for applying the negative voltage and the means for applying the one of the positive voltage and the ground potential as recited in amended independent claims 8 and 10 are structural features of the present invention which must be given patentable weight in accordance with the provisions of 35 USC 112, sixth paragraph.

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In view of the foregoing, it is respectfully submitted that the present invention as recited in amended independent claims 1, 5, 8 and 10 and claims 4, 11-13, 17 and new claims 18-21 respectively depending therefrom clearly patentably distinguish over the cited prior art references, taken singly or in combination, under 35 USC 103.

Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,

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